CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

January 14, 2000 / Vol. 49 / No. 1

MMWR™
MORBIDITY AND MORTALITY
WEEKLY REPORT

Neural Tube Defect Surveillance and Folic Acid Intervention — Texas-Mexico Border, 1993–1998

Neural tube defects (NTDs) are common and serious malformations that originate early in pregnancy. In the United States, approximately 4000 pregnancies each year are affected by the two most common NTDs (spina bifida and anencephaly). In 1992, the Texas Department of Health (TDH), with support from a CDC cooperative agreement, implemented the Texas Neural Tube Defect Project (TNTDP), a program of NTD surveillance and risk-reduction activities in the 14 counties that border Mexico. The project was initiated in response to an anencephaly cluster identified during 1990–1991 in Brownsville (Cameron County), Texas (*1*). Whether the high anencephaly rate (19.7 per 10,000 live births) was unique to Cameron County or was characteristic of the entire border was unknown. This report summarizes NTD surveillance rates for the 14 Texas-Mexico border counties for 1993–1998 and presents preliminary results of TNTDP efforts to prevent the recurrence of NTDs by providing folic acid to high-risk women. Findings indicate that the baseline rate along the border is high (13.4 per 10,000 live births) and largely reflects the rate among Hispanics (13.8). Although a longer period is needed to obtain definitive results, folic acid appears to be effective for reducing the risk for NTD recurrence in Hispanics.

The TNTDP surveillance system involved prospective case finding (*International Classification of Diseases, Ninth Revision* [ICD-9], codes 740, 741, and 742.0, for all gestational ages) using the following data sources: hospitals; birthing centers; ultrasound centers; abortion centers; prenatal clinics; genetics clinics; and birth attendants including lay midwives, certified nurse midwives, and nonhospital physicians. Data on NTD cases were collected by three field teams (El Paso, Harlingen, and Laredo), abstracted onto standardized forms, and sent to TDH with confirmatory medical records. Denominator data (live birth, death, and fetal death records) were derived from the Bureau of Vital Statistics at TDH; 91% of the resident live births in the border counties were to Hispanic women of Mexican ancestry.

For 1993–1998, NTD surveillance rates include cases at all gestational ages for the 14 Texas-Mexico border counties (Table 1). The surveillance system identified 360 resident NTD-affected births/terminations (cases) not otherwise accompanied by a known trisomy, triploidy, or syndrome (e.g., Turner, Meckel, or amniotic band). Of these cases, 324 (90%) occurred in the four most populous border counties—Cameron, El Paso, Hidalgo, and Webb. The overall NTD rate in the border counties for 1993–1998

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TABLE 1. Neural tube defect (NTD) type* and rate,† by county of residence — Texas-Mexico border, 1993–1998

	Anencephaly§		Spina bifida		All NTDs		
County	**No. cases**	**Rate**	**No. cases**	**Rate**	**Total¶**	**Rate**	**(95% CI**)**
Cameron	31	6.7	38	8.2	**73**	15.8	(12.4–19.8)
El Paso	39	4.3	36	4.0	**82**	9.0	(7.2–11.2)
Hidalgo	48	6.2	60	7.7	**118**	15.1	(12.5–18.1)
Webb	28	9.3	19	6.3	**51**	16.9	(12.6–22.2)
Other 10	17	7.1	17	7.1	**36**	14.9	(10.5–20.7)
Total	**163**	**6.1**	**170**	**6.3**	**360**	**13.4**	**(12.0–14.8)**

* NTD cases exclude the following accompanying conditions: trisomy (three), triploidy (three), Turner (one), Meckel (three), tethered cord (three), and amniotic band syndrome (four).
† Per 10,000 live-born infants.
§ Includes craniorachischisis (13) and inencephaly (one).
¶ Total includes encephaloceles (27).
** Confidence interval.

was 13.4 per 10,000 live births (6.1 for anencephaly, 6.3 for spina bifida, and 1.0 for encephalocele) (Table 1). The craniorachischisis (contiguous opening of brain and spinal column; included in anencephaly) rate in the border counties was 0.5.

Of the 360 women identified as having had an NTD-affected pregnancy, 340 (94.4%) were Hispanic. Of the 20 non-Hispanic women, 16 (4.4%) were white, three (0.8%) were black, and one (0.3%) was Asian/Pacific Islander. The rate among Hispanics was 13.8 per 10,000 live births and the rate among non-Hispanic whites was 8.8 ($p=0.08$). El Paso County (the northwesternmost county) had a significantly lower NTD rate (9.0) than the rest of the border counties combined (15.6; $p<0.001$). The rate among Hispanics also was significantly lower for El Paso County (8.8) than that for the rest of the border counties (16.1) ($p<0.001$).

Of the NTD-affected pregnancies, 68 (19%) were induced or spontaneously aborted at <20 weeks' gestation, 94 (26%) were delivered or induced at 20 through 33 weeks' gestation, and 198 (55%) were delivered at ≥34 weeks' gestation. Excluding fetuses that failed to reach 20 weeks' gestation would have lowered the overall rate to 10.8 per 10,000 live births ($p=0.01$).

The primary objective of TNTDP is preventing recurrence of NTDs by providing folic acid to women who have had an NTD-affected pregnancy. For the folic acid intervention program, all women identified through the surveillance protocol were contacted by telephone, letter, and/or in person. Women whose index pregnancy was delivered or terminated in 1993 or later and who resided in the study area were asked to enroll in the program. The enrolled women were interviewed and provided preconception, pregnancy, and NTD risk-reduction education and counseling. If the women used contraception, they were given a multivitamin with 0.4 mg folic acid; if the women did not use contraception, they were given daily doses consisting of 4.0 mg folic acid—one multivitamin containing 1.0 mg of folic acid and three 1.0 mg tablets of folic acid. Women were followed, counseled, and provided folic acid supplements at 1- to 3-month intervals.

As of December 31, 1998, 264 (73%) of the 360 women were eligible for enrollment in the folic acid intervention program; 96 (27%) women were not eligible for

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enrollment (moved out of area or had tubal ligations/hysterectomies). Of the 264 eligible women, 95 (36%) refused enrollment, quit, or were lost to follow-up; 17 (6%) consented but were pending enrollment; and 152 (58%) were taking folic acid. Of 65 (34%) eligible women with induced abortions, 22 (34%) refused participation in the folic acid intervention compared with 19 (15%) of 128 (p=0.004) who had had natural outcomes (i.e., live-born infants, stillbirths, or spontaneous abortions).

Pregnancy outcomes following the index NTD-affected pregnancy were assessed by telephone, letter, and home visits for 1993–1998. Overall, 89% of the women who had a subsequent pregnancy had taken folic acid before conception; of these, 64% had taken the daily 4.0 mg dose; 28%, the 0.4 mg dose; and 8%, a physician-prescribed prenatal vitamin. A pregnancy outcome was documented for 148 pregnancies; 117 (79%) of the pregnancies resulted in non-NTD–affected live births, 24 (16%) in miscarriages or incomplete spontaneous abortions, six (4%) in elective abortions, and one (1%) in a confirmed recurrent NTD. Five women known to be pregnant were lost to follow-up. None of the six elective abortions was NTD-affected. Excluding the 24 miscarriages and five pregnancies lost to follow-up, one of the remaining 124 pregnancies resulted in a recurrent NTD.

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Editorial Note: The preliminary results of the folic acid intervention suggest that high-risk women can reduce their risk for subsequent NTD-affected pregnancies. Each woman identified through the TNTDP surveillance protocol was at risk for recurrence and could not have been enrolled in the folic acid intervention program without being identified through surveillance. One fifth of the high-risk women in the program would have been missed if only fetuses at >20 weeks' gestation were included in the surveillance. Why women with induced abortions are less likely to take folic acid than women with natural outcomes is unclear and warrants further study. The woman who had a recurrent NTD-affected baby refused to meet with field staff and never received NTD risk-reduction education, counseling, or folic acid. The one NTD recurrence was less than the three to five that would have been expected based on a 3% to 4% recurrence rate (p=0.18, 0.10 respectively).

The NTD surveillance data indicate that baseline rates along the border are high and largely reflect the rate among Hispanics. Some of the variability in the rates may be partially explained by the unique cultural and environmental factors along the border. For example, compared with the rest of the border, El Paso County residents have a higher standard of living and are less likely to be employed as migrant farm workers (*1*). In addition, the overall Texas-Mexico border rate for craniorachischisis was 0.5, a rate significantly higher (p=0.048) than the rate for this defect in the metropolitan Atlanta area (0.1) (*2*). This suggests that an unknown risk factor may exist, especially in Hidalgo County where six (46%) of these rare defects occurred. Findings from the 1993–1998 recurrence period showed that only 9% of El Paso County women who delivered normal live-born infants reported taking periconceptional folic acid (TNTDP, unpublished data, 1999). Although the 9% usage reported for El Paso County is low compared with national reported usage (25%) (*3*), usage for Cameron County is even lower (3%).

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The findings in this report are subject to at least two limitations. First, nonresident women who migrated for birth into the United States and either returned to Mexico or to another county were not eligible for the intervention program; further, resident women who moved, were lost to followup, or had tubal ligations/hysterectomies decreased the potential intervention sample size by 40%. Second, some underestimate of cases occurred because of pregnancy outcomes that occurred outside the area.

Although a sufficient number of pregnancy outcomes have yet to occur among high-risk women to achieve statistical significance, folic acid appears to reduce the risk for NTD recurrence in Hispanic women. Unlike other U.S. surveillance systems (*4,5*), since its inception the TNTDP has included cases at <20 weeks' gestational age. These data underscore the importance of a timely and active NTD surveillance system that includes fetuses at <20 weeks' gestational age for population-based and individual NTD prevention. They also highlight the need for physicians to educate their high- and low-risk patients about the benefits of folic acid (*6,7*).

References

1. Hendricks KA, Simpson JS, Larsen RD. Neural tube defects along the Texas-Mexico border, 1993–1995. Am J Epidemiol 1999;149:1119–27.
2. Moore CA, Li S, Li Z, et al. Elevated rates of severe neural tube defects in a high prevalence area in Northern China. Am J Med Genet 1997;73:113–8.
3. CDC. Knowledge and use of folic acid by women of childbearing age—United States, 1995. MMWR 1995;44:716–8.
4. Roberts HE, Moore CA, Cragen JD, et al. Impact of prenatal diagnosis on the birth prevalence of neural tube defects, Atlanta, 1990–1991. Pediatrics 1995;96:880–3.
5. Velie EM, Shaw GM. Impact of prenatal diagnosis and elective termination on prevalence and risk estimates of neural tube defects in California, 1989–1991. Am J Epidemiol 1996;144:473–9.
6. Smithells RW, Seller MJ, Nevin NC, et al. Further experience of vitamin supplementation for prevention of neural tube defect recurrences. Lancet 1983;1:1027–31.
7. American Academy of Pediatrics, Committee on Genetics. Folic acid for the prevention of neural tube defects. Pediatrics 1999;104:325–7.